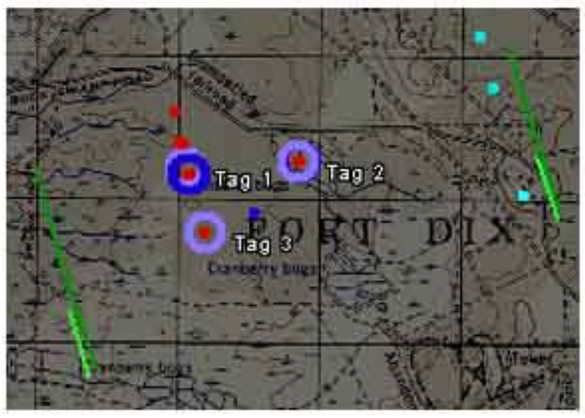
Radio-Frequency Tags

FACT SHEET

Tags Mark the Spot

Radio-frequency tags are small, battery-powered transceivers, which can be placed on assets for monitoring purposes. A tag may simply provide a communications link between a sensor and a receiving interrogator, or it may also allow locating and tracking. Sandia National Laboratories has developed a wide range of tags for both Department of Energy sensor monitoring applications and DoD tracking and targeting applications. This fact sheet addresses a special class of long-range tags, known as radar-responsive tags. Radar-tag applications include battlefield situational awareness, unattended ground sensors data relay, vehicle tracking, search and recovery, precision targeting, special operations, and drug interdiction.



Mission

Sandia's radar tag work emphasizes the following technical areas:

- **Tags responsive to airborne radars (radar-responsive tags)**
- **Tag-system concept development**
- **Development of miniaturized, pre-production tag prototypes**
- **Identification and facilitation of necessary radar modifications**
- **Flight-test demonstration and data analysis**

Radar-Responsive Tags

Radar tags are activated when illuminated by a radar's transmissions. The tag then modulates the radar signal and transmits back to the radar. Special signal processing in the radar determines the tag's location. The radar processor may also decode data uplinked from the tag. Advantages of radar tags over beacon transponders include:

- **Lower probability of detection and interception**
- **Lower transmit power**
- **Longer range**
- **Smaller battery**

Experience

Sandia has over 25 years experience in the design and development of tag communication and geolocation systems. Over the past 10 years, we have developed, integrated, and flight tested radar-responsive tags for a variety of customers and flight platforms in the UHF, X, and Ku bands.

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.

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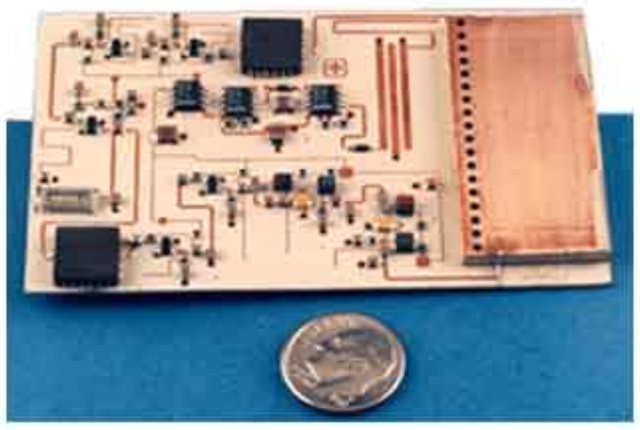
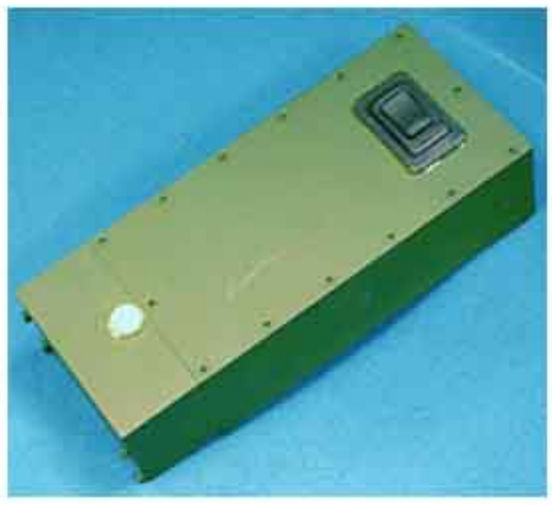
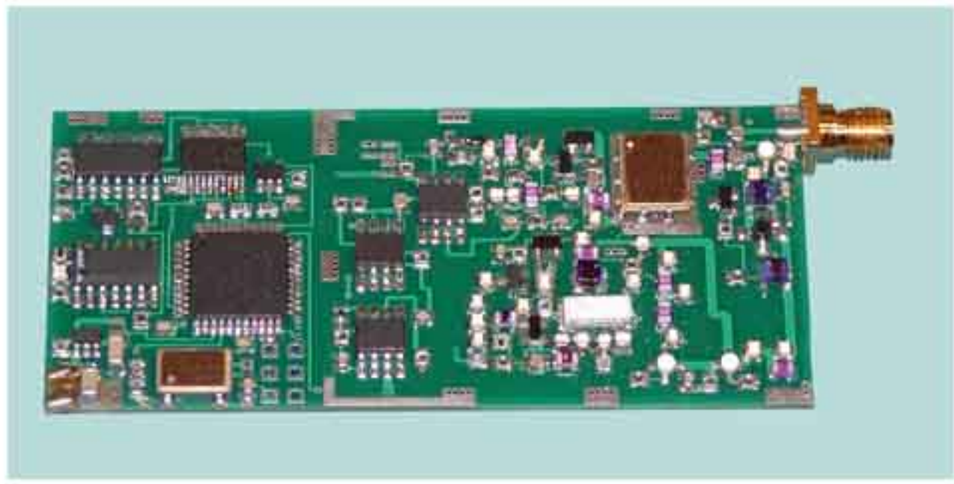




Development Capability

Sandia designs and develops all tag hardware and software elements. We also define and, as appropriate, implement required radar software modifications to assure compatibility of the tag and the radar. We have significant design capabilities in the following areas:

- **Miniaturized, mixed-signal electronics**
- **Low power RF and digital circuits**
- **High-gain, high-isolation transponder loops**
- **Dual-band architectures**
- **Compact packaging (electronics, batteries, and antennas)**
- **Real-time embedded software**



Sandia's tag capabilities complement our state-of-the-art work in synthetic aperture radar and are synergistic with industry radar systems.

Innovative Technologies

Sandia has developed radar-responsive tag techniques that demonstrate the following features:

- **Coherent tag response to radar**
- **Low-duty-cycle operation of the tag for low power consumption**
- **Modulation methods for stealthy tag response (LPI/LPD)**
- **Clutter suppression techniques to enhance the tag's signature**
- **Precise geolocation of the responding tag independent of GPS**
- **Signaling and radar processing to uplink the tag's data**

www.sandia.gov/RADAR/sar.html

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